

PATENT SPECIFICATION

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(54) ROLLER BEARING ASSEMBLIES

(71) We, BORG-WARNER CORPORATION, a corporation duly organized and existing under and by virtue of the laws of the State of Delaware, United States of America, having its principal office and place of business at 200 South Michigan Avenue, Chicago, Illinois 60604, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to roller bearing assemblies.

Housings, such as pillows and flange blocks with roller bearing inserts are known in the art. There are basically two varieties of bearing assemblies, one is a fixed position bearing assembly and the other is known as a self-aligning bearing assembly. The fixed position bearing assembly is capable of handling only slight shaft misalignment, but is generally compact and has relatively few parts. The self-aligning bearing assembly is generally more complex, larger, and is constructed of a large number of parts. Usually, a self-aligning bearing assembly cannot be fitted to the space requirements of the fixed bearing assembly.

According to the invention, there is provided a roller bearing assembly comprising a housing adapted to be fixed to a support and having a cavity for receiving a roller bearing unit, said cavity being defined by an inner arcuate surface, and a roller bearing unit in said cavity, said roller bearing unit comprising:

inner and outer races;
 a pair of roller assemblies between said inner and outer races;

said inner race having spaced conical raceways for contact with rollers of the assemblies and a concentric cylindrical bore

[Price 33p]

for receiving a shaft;

said outer race comprising:

a) a ring-like member having an outer arcuate surface for contact with the inner surface of said housing cavity, an inner conical raceway for contact with the rollers of one roller assembly, and an interior cylindrical bore joining said interior raceway;

b) a ring member having an outside cylindrical configuration corresponding to said bore and received therein; and an inner conical raceway for contact with the rollers of the other roller assembly,

and means for retaining the ring member of said outer race in operational position, said arcuate surfaces of said housing and said outer race permitting movement of said bearing unit relative to said housing to accommodate misalignment of the shaft relative to the support for the housing.

The housing is preferably a pillow block casting and the roller bearing unit fashioned as a replaceable, sealed, pre-lubricated cartridge which is fully self-aligning. Such an assembly may be small, simple and of relatively few parts. The assembly is capable of construction to replace conventional fixed position assemblies now in commercial use in the United States, without occupying additional space. While the bearing unit is pre-lubricated, preferably it is constructed to permit re-lubrication as required.

Preferably, the pillow block casting has its cavity defined by an internally machined spherical surface which mates with an external spherical surface on the bearing unit, such that the bearing unit can move relative to the casting to provide the afore-mentioned self-aligning feature. In practice, the external spherical surface would be provided on the ring-like member of the outer race. Each of the pair of roller assemblies preferably comprises a set of

tapered rollers, a roller retainer or cage for each set of rollers, and lubricant seals at the ends of the bearing unit. The ring member retaining means may take several forms and be constructed to permit pre-loading of the bearing unit to a customer's specifications. An opening is preferably provided in the pillow block casting for the introduction of lubricant whereby the bearing assembly as stated may be (factory) pre-lubricated and re-lubricated as required.

There are several pillow block castings which can be used. One is provided with a loading slot through which the bearing unit can be inserted. Another is a split block casting constructed of a base and top, and divided through the bearing receiving zone. A third block casting has an adaptor ring used to retain the bearing unit in operating position. While any pillow block casting may be used to receive the bearing unit constructed according to the teachings herein, it must be remembered that the bearing unit is of such size as to replace the fixed position assemblies; in other words, the pillow block casting is also compact.

The bearing unit is also usable with flange blocks to form a bearing assembly; the same advantages are realized when so used.

In order that the invention may be well understood there will now be described two embodiments thereof, given by way of example only, reference being had to the accompanying drawings, in which:

Figure 1 is an end elevation view of a roller bearing assembly embodying the invention;

Figure 2 is a sectional view on line 2-2 of Figure 1; and

Figure 3 is a sectional view similar to Figure 2 and illustrating a modified roller bearing assembly.

In Figures 1 and 2 there is shown a roller bearing assembly comprising a pillow block casting (or housing) 10 having a socket or cavity 12, defined by an internal spherical surface 14, receiving a roller bearing unit 16. The centre of the radius of the arc which generates the surface 14 is located at the geometric centre G of the bearing unit 16. The base of the casting 10 is provided with elongate openings 18 for receiving bolts (not shown) by which the block is mounted for lateral adjustment on a support.

The block 10 has a loading slot 20 for receiving the bearing unit 16. The loading slot has cylindrical ends 22 of a radius at least as large as the spherical radius of the bearing unit 16, and a width at least as wide as the outer race assembly of the bearing unit 16. The loading slot 20 ex-

tends from the centre plane of the block axially to one open end of the bearing socket 12. The bearing unit 16 is inserted by turning it so that its axis is perpendicular to the axis of the block. After inserting the bearing unit 16 into the socket 12, it is turned to usable position. Removal of the bearing unit 16 requires reversal of these steps. A conventional grease fitting 24 is screwed into a tapped opening 26 in the pillow block casting 10 to provide means whereby a lubricant can be introduced between that casting and the bearing unit 16.

In some cases, the bearing unit 16 is assembled after the outer race is loaded into the pillow block casting. Also, while the above describes assembly in a loading slot block casting, it is to be noted that the bearing unit is adaptable for use with the other types of block castings.

The bearing unit 16 comprises a cylindrical inner race 30, a two part outer race assembly 32, a pair of roller assemblies 34, 36, and roller retaining members or cages 38.

The inner race 30 has an inside diameter 44 disposed to receive a shaft of substantially the same diameter, and an outside configuration comprising two conical raceways 46, 48, having axes which coincide with one another and also with the axis of the inside diameter. The raceways are disposed to receive the conical rollers 34A, 36A of the groups of rollers in contact when operationally oriented. Extensions 50 of the inner race are slotted, as at 52, for receiving shaft locking means 54 by which the shaft is locked in position. While Figures 1 and 2 of the drawing illustrate a shaft locking means 54 at one end of the bearing unit, it should be understood that in some instances the inner race has two extensions 50, so that locking means 54 at both ends are required or can be used.

The outer race assembly 32 comprises a member 56 having an outer spherical surface 57 and a conical raceway 58 for contact with one group of rollers. The member 56 has a cylindrical bore 60 to receive an adaptor ring 62 having an outer cylindrical surface 64 of a diameter to fit into the bore 60. The ring 62 is formed with a conical raceway 66 for contact with the other roller bearing group. Various means may be used to retain the ring 62 and the member 56 in assembled relationship. Also, such means provides a convenient method for providing controlled end play and a method of preloading the bearing unit 16 to a customer's specification. For example, the member 56 may be slotted at 68 to receive a split locking ring 70; various widths of locking rings may be used. The

members may be threaded such that the ring 62 can be screwed into the member 56. The ring 62 and member 56 may be press fitted or even welded.

- 5 Sealing means 72 are positioned at the ends between the inner and outer races to prevent the escape of lubricant and to seal the bearing against the ingress of dirt or other foreign material. The sealing means 10 is such to permit relative motion between the inner and outer races.

- Figure 3 illustrates a modification of the bearing assembly. The primary difference between the bearing assemblies of Figures 15 2 and 3 is that the centre C of the radius of the surface of revolution of the spherical outer surface 14 of the Figure 3 embodiment is offset from the geometric centre G of the bearing unit.

- 20 The "off centre" feature permits a reduced size casting, with substantially uniform wall thickness and providing substantially uniform casting strength. Uniform walls permits uniform heat treatment and 25 the structure, because of the uniformity of wall thicknesses, gives full load capacity under any misalignment. The bearing unit is such that it can be selectively positioned depending on the thrust load. 30 The bearing unit is positioned so that extreme thrust loads are applied to the right side thereof, as viewed in Figure 3. All other parts are the same as in the description of Figure 2 and are identified with 35 like reference characters, so that reference is made to the prior description for the description of the various parts. Here, locking collars 54 are illustrated at each end of the bearing unit.

- 40 Each bearing assembly described is provided with a radial opening 74 counter-bored at 76. Lubricant is introduced through the opening 74 and the counter-bore 76. A pin 78 retained in the block fits 45 into the counterbore 76 to position the bearing unit in the block. The pin 78 eliminates rotary motion of the outer race without interfering with the ability of the bearing unit to be self-aligning; it can be 50 removed to re-lubricate the bearing unit.

- While the bearing units have been described with respect to a pillow block casting, the structure of each bearing unit can be used equally as well in a flange block, 55 and the bearing unit while preferably being pre-assembled and preferably factory sealed, can be assembled on the site and sealed at that time.

60 WHAT WE CLAIM IS:—

1. A roller bearing assembly comprising a housing adapted to be fixed to a support and having a cavity for receiving a roller bearing unit, said cavity being defined by 65 an inner arcuate surface, and a roller bear-

ing unit in said cavity, said roller bearing unit comprising:

inner and outer races;
a pair of roller assemblies between said inner and outer races; 70

said inner race having spaced conical raceways for contact with rollers of the assemblies and a concentric cylindrical bore for receiving a shaft;

said outer race comprising: 75

a) a ring-like member having an outer arcuate surface for contact with the inner surface of said housing cavity, an inner conical raceway for contact with the rollers of one roller assembly, and an interior 80 cylindrical bore joining said interior raceway;

b) a ring member having an outside cylindrical configuration corresponding to said bore and received therein; and an 85 inner conical raceway for contact with the rollers of the other roller assembly,

and means for retaining the ring member of said outer race in operational position, said arcuate surfaces of said housing and 90 said outer race permitting movement of said bearing unit relative to said housing to accommodate misalignment of the shaft relative to the support for the housing.

2. A roller bearing assembly as claimed in claim 1, wherein said last named means permits controlled end-play and controlled 95 preloading of the assembly.

3. A roller bearing assembly as claimed in claim 1, wherein said outer race is 100 provided with a groove in said bore and wherein said retaining means comprises a split locking ring received in said groove.

4. A roller bearing assembly as claimed in claim 1, wherein said ring-like member 105 of said outer race is internally threaded and said ring member is externally threaded to be threadably received in said ring-like member.

5. A roller bearing assembly as claimed in claim 1, wherein said ring member is 110 frictionally received in said ring-like member.

6. A roller bearing assembly as claimed in claim 1, wherein said ring member is 115 welded to said ring-like member.

7. A roller bearing assembly as claimed in any of the preceding claims, wherein the radius of the generating arc of the arcuate surface of said outer race has a centre at 120 the geometric centre of the bearing unit.

8. A roller bearing assembly as claimed in any of claims 1 to 6, wherein the radius of the generating arc of the arcuate surface of said outer race has a centre offset from 125 the geometric centre of the bearing unit.

9. A roller bearing assembly as claimed in any of the preceding claims, further comprising means for introducing lubricant 130 into said roller bearing assembly.

10. A roller bearing assembly as claimed in any of the preceding claims, further comprising means for limiting rotation of said outer race in said housing with a shaft received in the inner race.

11. Either of the roller bearing assemblies substantially as herein described with reference to and as shown in the accompanying drawings.

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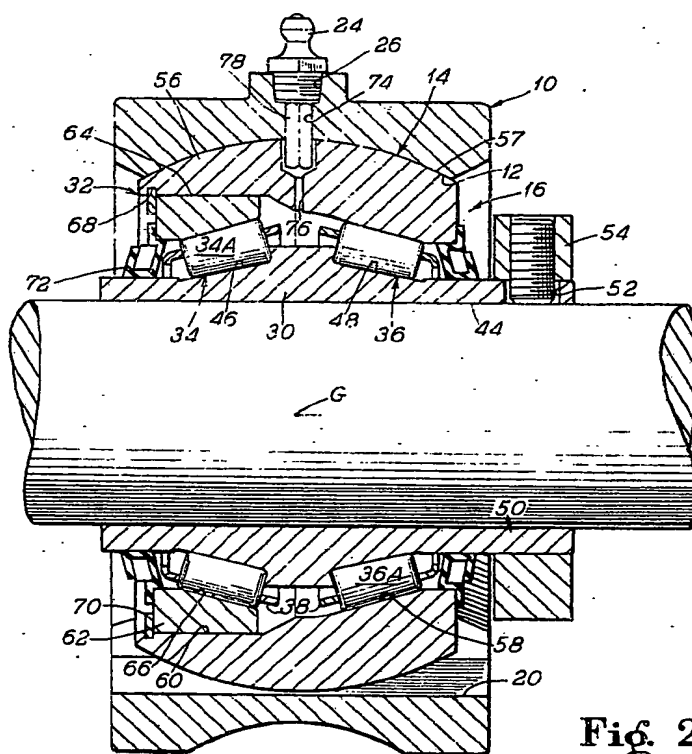
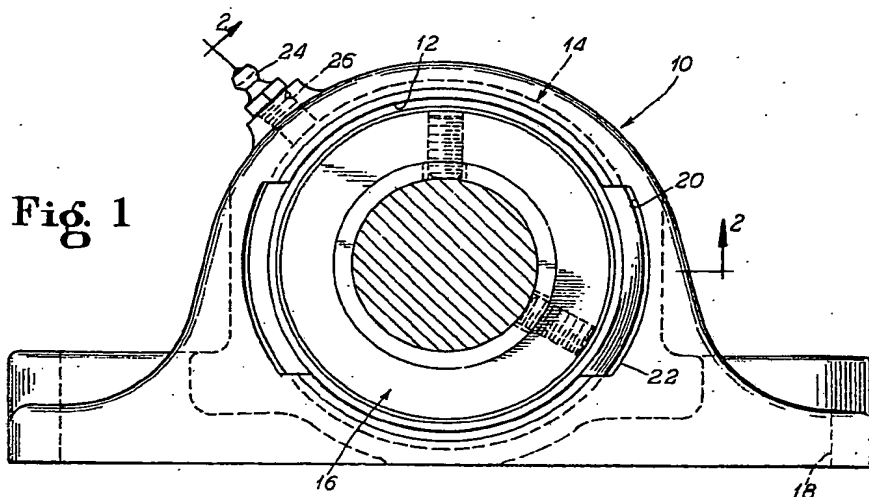
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2 SHEETS

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the Original on a reduced scale
Sheet 1



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Sheet 2

